SIMULATION OF PIPELINE SYSTEMS OPERATIONS

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Creating simulation models of the pipeline systems functioning and algorithmization processes of management mode allows improve the quality and efficiency of the automated process control systems or automated systems of dispatching management of it operation on practice. In the design of the automated process control systems or automated systems of dispatching management of pipeline systems it is the most important stage of the development of algorithms for operational control modes of operation. In assessing the effectiveness of the algorithms necessary to take into account both the characteristics of supply and distribution process of the desired product and the random nature of impacts faced by the pipeline system. This fact necessitates the creation of simulation models not only for piping systems and the environment in which it operates, but also the system of automated control regimes of its functioning as a whole.

When implementing the simulation model reproduces the process of the algorithm of the system over time, which enables us to source data to obtain information about the process states at certain times, making it possible to evaluate the performance of the system. Currently, simulation - the most effective method for studying large-scale systems and often the only available practical method for receiving information about the behavior of the system, especially in its inception. The main criteria for the appropriateness applying of simulation method are: the absence or unacceptability of analytical, numerical and qualitative methods to solve the problem; availability of sufficient background information about simulated system which gives an opportunity to enable to build an adequate simulation model; the necessity on the basis of other possible methods to solve a very large number of calculations, what is difficult even with implementation using a computer; the possibility of finding the optimal variant of the system when it is on a computer simulation. The presence of such simulation models allows to generate and analyze processes in real flow distribution pipeline systems, to play on the model and choose the optimal structure of the control system, taking into account the specific characteristics of the pipeline system (dimension, network configuration, the number of active sources), to evaluate the quality and effectiveness of implemented controls. In addition, an adequate simulation model gives an opportunity to evaluate the status of all elements of pipeline systems based on actual measurements of the output parameters in a number of them (a measure of the proximity of these values is the main criterion for the adequacy of simulation processes). An essential feature of management tasks load flow in the pipeline system is the lack, in general, analytical relationships for the output control parameters and quality criteria for the functioning of the pipeline systems, which makes it virtually impossible to find analytical solutions. The only acceptable solution is the method of simulation of pipeline systems operations , allowing to obtain the expectations of grade quality criteria for the effectiveness of management of modes of piping systems subject to limitations imposed by technology.

Implementation of the system of operative management of pipeline systems is provided by the decision of a number of hierarchically interrelated tasks. In accordance

with the structure of the simulation model of the system of operational process control, operation of pipeline systems it is represented as a set of interacting functional modules, each of which purpose is to solve a particular problem. Total modeling algorithm for the simulation model is the decomposition of the process operation of pipeline systems for a number of events, each of which means a change in the status of pipeline systems in time due to the external environment and internal communications between its separate elements. Depending on the problems to be solved in the simulation, different depth of detail of the models of piping systems are presented.

A simulation model of operational process control operation of pipeline systems could be built using the principles of blocking structure, modular algorithms and software, information interchange modules having a single information base model. Used a simulation model of operational management processes operation of pipeline systems should be universal, because it must take into account the development of pipeline systems in space (in the territory) and time and provide the possibility for replication pipeline systems of various cities and towns.

Handling certain aspects of operational management of pipeline systems in the simulation model corresponds to the software implementation of appropriate algorithms. In general, the simulation model of control processes in the pipeline system comprises basically modeling processes functioning of individual components and piping systems as a whole. For the concept analysis as well as the formalization of all real processes occurring in such complex systems, network structure as pipeline systems, comes to the aid of simulations.

The process flow of the desired product pumping stations is described in accordance with a known polynomial of the second degree; analysis of the functioning of the pumping station units each preceded by the identification of their parameters in order to ensure the adequacy of the actual pumping stations and their models. The distribution of the expected product in piping systems for pipelines and between individual consumers as well as a whole load flow in piping systems is determined by solving the system of equations of mathematical models. In this case, the unknown values of the components of variable pressure and flow in the parts of the network, is uniquely characterized by load flow in piping systems shall be determined on the basis of the decision of problems of analysis or hydraulic calculation of pipeline systems (depending on the achieved goal) when specifying the appropriate combination of some of these variables as the boundary conditions at the inputs and outputs of pipeline systems.

A simulation model of pipeline systems is a tool for studying the efficiency of algorithms for solving practical problems of improving the efficiency and quality of operational control modes of operation of pipeline systems. Simulation model should be used for training dispatchers in the pre-launch period of automated process control systems or automated systems of dispatching management. It can also be used as a reference when checking the adequacy of the solutions obtained by a simple aggregated model of pipeline systems.